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(71) Applicant : **TRANSPORTATION RECORDING SYSTEMS, INC.**
302 South Jones Street
Barneveld, Wisconsin 53507 (US)

(72) Inventor : **Carmody, C. Scott**
302 South Jones Street
Barneveld, Wisconsin 53507 (US)
Inventor : **Kron, Gregory M.**
14625 West Park Avenue
New Berlin, Wisconsin 53151 (US)

(74) Representative : **Carpenter, David**
MARKS & CLERK,
Alpha Tower,
Suffolk Street Queensway
Birmingham B1 1TT (GB)

(54) System for recording expense type information in combination with information pertaining to one or more operating characteristics of a vehicle.

(57) A system for monitoring certain vehicle operating information and recording other date includes a vehicle interface unit (22) permanently mounted to a vehicle, and a data recorder unit (20) removably interconnectable with the vehicle interface unit (22). The vehicle interface unit (22) receives signals from the vehicle through the vehicle's interface connector (24), such as signals pertaining to distance travelled and other operating characteristics, e.g. operation of headlights, directional signals, brakes or seat belts, and such signals are communicated through a communications link to the data recorder unit (20). The data recorder unit (20) includes a memory in which such information is stored, and the data recorder unit (20) can be disconnected from the vehicle interface unit (22) and interconnected with an external device such as a computer or printer for outputting information stored in the memory. The data recorder unit (20) can also be used to store other information, such as pertaining to business expenses or the like.

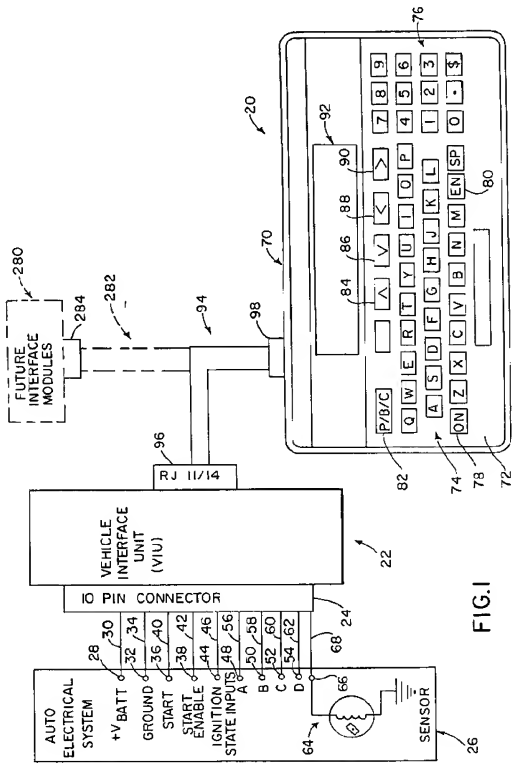

FIG.1

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This invention relates to a system for use in combination with a vehicle to monitor and record certain information pertaining to operation of the vehicle along with other information manually input by the operator, such as for use in tracking expenses.

Generally, it is beneficial for persons who use a vehicle in connection with a business to keep track of the number of miles traveled by the vehicle for business purposes. When the vehicle owner is an individual using his or her personal vehicle for business purposes, this information can typically be used to generate a deduction on the person's income tax returns. When the owner of the vehicle is an employer, it is important to keep track of the amount of miles logged by the employee both for business and personal purposes.

In the past, a typical method of keeping track of business and personal use of a vehicle has been to maintain a written log in which the operator enters by hand the date of operation and information allowing the operator to calculate the number of business miles traveled, typically start and stop readings taken from the vehicle's odometer. One drawback to this type of system is that it relies on the operator to accurately record the necessary information. Another drawback is that, if the operator wishes to keep track of other expenses, such as meals, lodging, entertainment or the like, the operator must keep a separate log of such information, thus generating separate sets of records for related expense information. Another drawback is that the operator must diligently record expense information including vehicle mileage in order to keep an accurate record, which is often easily overlooked.

It is an object of the present invention to provide a system for monitoring and recording information pertaining to vehicle operation for assisting an operator to accurately track and record business or personal use of the vehicle. It is a further object of the invention to provide a system enabling the operator to input and record other information, such as expenses pertaining to meals, lodging and entertainment. It is a further object of the invention to provide such a system which is user-friendly, making it as easy as possible for an operator to provide an accurate and reliable record of information pertaining to expenses and vehicle operation. A further object of the invention is to provide such a system which is relatively simple in its components and operation, yet which provides highly satisfactory performance.

In accordance with one aspect of the invention, a vehicle monitoring and data recording system includes a vehicle interface unit adapted for interconnection with the electrical system of the vehicle for sensing one or more operating characteristics of the vehicle, and for outputting a first set of data signals indicative of the sensed vehicle operating characteristic. The system further includes a portable recorder unit adapted for removable interconnection with the vehicle interface unit. The portable recorder unit includes a memory, an input for receiving the first set of data signals from the vehicle interface unit, and a manually operable data entry device. The input provides the first set of data signals to the memory, and the manually operable data entry device allows an operator to input data, to thereby output a second set of data signals to the memory in response thereto. A processor is interconnected with the memory, and the recorder unit is disconnectable from the vehicle interface unit and connectable to an external device, such as a computer or printer, for outputting to the external device a third set of data signals from the memory which includes the first and second sets of data signals. The vehicle interface unit is in the form of a module interconnected via a series of buses with the electrical system of the vehicle, with each bus providing a signal to the module indicative of the status of one of the vehicle's operating characteristics. The vehicle interface unit includes a processor interconnected with the buses for processing signals provided thereby and for generating the first set of data signals in response thereto. The vehicle interface unit may be interconnected with the ignition system of the vehicle, so as to prevent vehicle ignition unless the portable recorder unit is connected to the vehicle interface unit. The vehicle interface unit receives signals from the vehicle indicative of distance traveled by the vehicle, such as the signals provided to the vehicle's odometer. The manually operable data entry device is preferably in the form of a keypad, which allows an operator to input a signal to the memory indicative of the business or personal nature of the vehicle mileage. In addition to vehicle mileage, the vehicle interface unit may be interconnected with the electrical system of the vehicle to monitor other vehicle operating characteristics, such as brake operation, directional signal operation, seat belt use and headlight operation.

The invention further contemplates a method of monitoring vehicle operating characteristics and recording data. The method involves sensing one or more vehicle operating characteristics, and generating a first set of data signals indicative of the one or more sensed vehicle operating characteristics. The first set of data signals are stored in a portable recorder unit removably interconnected with the vehicle. The method further involves generating a second set of data signals by manual operation of a data entry device; storing the second set of data signals in the portable recorder unit; disconnecting the portable recorder unit from the vehicle and interconnecting the portable recorder unit with an external device such as a printer or computer; and outputting to the external device a third set of data signals which includes the first and second sets of data signals. The particulars of the method are substantially in accordance with the foregoing summary.

Various other features, objects and advantages of the invention will be made apparent from the following description taken together with the drawings.

The drawings illustrate the best mode presently contemplated of carrying out the invention.

In the drawings:

Fig. 1 is a schematic representation of the vehicle monitoring and data recording system of the invention, showing the vehicle interface unit interconnected with the vehicle's electrical system and the portable recorder unit interconnected with the vehicle interface unit;

Fig. 2 is a schematic representation showing interconnection of the portable recorder unit with an external device such as a computer or printer;

Fig. 3 is a schematic representation of the components of the vehicle interface unit of the system of Fig. 1; and

Fig. 4 is a schematic representation of the components of the portable recorder unit of the system of Fig. 1.

Referring to Fig. 1, a vehicle monitoring and data recording system constructed according to the invention generally includes a portable data recorder unit (DRU) 20 and a stationary vehicle interface unit (VIU) 22 connected via a connector 24 with the electrical system of a vehicle. Typically, the vehicle's electrical system includes an interface connector, shown generally at 26, located within the interior compartment of the vehicle. Interface connector 26 includes a series of terminals to which vehicle interface unit 22 is connected via a series of buses interconnected with connector 24. Such terminals include a power terminal 28 which supplies power to VIU 22 from the vehicle via a bus 30; a ground terminal 32 providing ground potential to VIU 22 through connector 24 and a bus 34; a start terminal 36 and a start enable terminal 38 providing signals to VIU 22 through connector 24 and buses 40, 42, respectively; an ignition terminal 44 providing an ignition signal to VIU 22 through connector 24 and a bus 46, and oparating state terminals 48, 50, 52 and 54 providing input signals to VIU 22 through connector 24 and buses 56, 58, 60 and 62, respectively. State inputs A-D at terminals 48-54 may be that such as the vehicle's headlights, directional signals, brakes, seat belt indicators or the like.

Vehicle interface connector 26 further includes an odometer sensor 64 which provides pulses to a terminal 66 which are communicated via a bus 68 and connector 24 to VIU 22. Each pulse generated by sensor 64 is indicative of a predetermined distance traveled by the vehicle, which enables the vehicle odometer to output a mileage reading and the vehicle speedometer to output an instantaneous indication of the speed at which the vehicle is traveling.

DRU 20 includes a housing 70 having a front panel 72. A standard QWERTY keypad, shown generally at 74 is mounted to front panel 72, along with a numeric keypad 76, a power key 78, an "enter" key 80, and a personal/business/commute (P/B/C) key 82. A series of cursor movement keys 84, 86, 88 and 90 are also mounted to housing front panel 72. A display 92, such as an LCD display, is mounted to housing front panel 72 above keypad 74.

DRU 20 and VIU 22 are interconnected with each other via a conventional six-wire RJ11/14 shielded power and communications cable 94. RJ11/14 connectors or ports 96, 98 are provided on VIU 22 and DRU 20, respectively, for receiving the ends of cable 94. Cable 94 can be disconnected from either or both of connectors 96, 98, enabling DRU 20 to be removably connected to VIU 22.

As shown in Fig. 2, DRU 20 can be interconnected with external devices, such as a computer 100 or a printer 102, equipped with communication ports 104, 106, respectively. Computer 100 and printer 102 are adapted for interconnection with DRU 20 by communication links 108, 110, respectively. Preferably, DRU 20 is connectable to either one or the other of computer 100 or printer 102, so as to enable information contained within DRU 20 to either be downloaded into a data storage device associated with computer 100 or to be printed through printer 102.

The components of VIU 22 are illustrated in Fig. 3. As noted previously, VIU 22 is interposed between vehicle interface connector 26 and DRU 20, with DRU 20 being removably connectable to VIU 22 through communication ports 96.

VIU 22 concludes a programmable microcontroller 112. Microcontroller 112 receives power from the vehicle through voltage and current protection circuit 114 interconnected with the vehicle's power source, such as a battery, via line 30, and ground potential through line 32; a voltage regulator 116 interconnected with voltage and current protection circuit 114 via a line 118; and a power conditioning circuit 120 interconnected with voltage regulator 116 via a line 122, and with microcontroller 112 via a line 124. Microcontroller 112 receives input voltage signals through a signal voltage conditioning circuit 126, which is interconnected with start terminal line 40, start enable terminal line 42, ignition line 46, and vehicle operating state input lines 56, 58, 60 and 62. These input voltage signals are provided to microcontroller 112 through lines 128, 130, 132, 134, 136, 138 and 140, respectively.

A manually operable bypass switch 142 is interconnected between start line 40 and start enable line 42. A start enable relay 144 receives power from a line 146 interconnected with line 118, and is interconnected with start enable line 42 and with start line 40 through a line 148. Start enable relay 144 is interconnected with microcontroller 112 through a line 150.

Vehicle mileage pulse line 68 is interconnected with microcontroller 112 through a low level signal conditioning circuit 152 having an enabling circuit

153, and a line 154. An RS-232 communications transceiver 156 including an enabling circuit 158 transmits signals to microcontroller 112 through a line 160, and receives signals from microcontroller 112 through a line 162. Enabling circuit 158 of transceiver 156 is interconnected with microcontroller 112 via a line 164, which in turn is interconnected with enabling circuit 153 of low level signal conditioning circuit 152 via a line 166. A conventional resonator 168 is interconnected with microcontroller 112 through lines 170, 172.

Through communication port 96, protected voltage and ground potential is provided to DRU 20 through lines 174, 176, respectively. Cable 94 includes a line 178 which transmits signals from microcontroller through transceiver 156 to DRU 20, and a line 180 which transmits signals from DRU 20 to microcontroller 112 through transceiver 156.

Fig. 4 illustrates the components of DRU 20. DRU 20 includes a programmable microcontroller 184 interconnected with a conventional resonator 186 via a line 188. DRU 20 further includes an RS-232 transceiver 190, which is interconnected with lines 178, 180 from VIU 22 through DRU communication port 98. Transceiver 190 transmits signals to microcontroller 184 through a line 192, and receives signals from microcontroller 184 through a line 194. Transceiver 190 further includes an enabling circuit 196, which is interconnected with microcontroller 184 through a line 198.

DRU 20 is further equipped with a rechargeable battery 200, which is charged by a charge circuit 202 and lines 204, 206 and 208. Charge circuit 202 is interconnected with power line 210, which in turn is interconnected with lines 174, 176 from VIU 22 for transmitting power to DRU 20. Line 208 further provides power to an LCD intensity control 212. Power is supplied from battery 200 or charge circuit 202 to a voltage drop circuit 214 and to microcontroller 184 through a line 216. Similarly, power is supplied from charge circuit 202 to a voltage regulator circuit 218 including an enabling circuit 220. A line 222 extends between voltage regulator 218 and a program memory 224, and a line 226 extends between voltage regulator circuit 218 and microcontroller 184. A line 228 interconnects voltage regulator enabling circuit 220 with microcontroller 184.

A line 230 extends between power line 222 and transceiver 190.

Microcontroller 184 is further interconnected with a contrast control circuit 232 through a line 234, and contrast control circuit 232 in turn is interconnected with transceiver 190 through a line 236 and with an LCD controller/driver circuit 238 through a line 240. Power is supplied to LCD controller/driver circuit 238 through a line 242 from power line 222. Microcontroller 184 is interconnected with intensity control circuit 212 through a line 244.

Power is supplied to microcontroller 184 from battery 200 through line 216, or from charge circuit 202 through voltage regulator 218 and a line 246 extending between microcontroller 184 and power line 222.

Program memory 224 is interconnected with microcontroller 184 through a line 248, and a nonvolatile RAM 250 is interconnected with microcontroller 184 through lines 252, 254. A clock 256 having a crystal 258 is interconnected with RAM 250 through a line 260, and with microcontroller 184 through a line 262.

An audible beeper 264 is interconnected with microcontroller 184 through a line 266. Microcontroller 184 is interconnected with LCD controller/driver circuit 238 through a line 268, and LCD 92 is interconnected with LCD controller/driver circuit 238 through a line 270. LCD back light intensity control circuit 212 is interconnected with an LCD back light 272 through a line 274.

In operation, the above-described components function as follows. Initially, VIU 22 is interconnected with vehicle interface connector 26, and is mounted in an inconspicuous location within the interior of the vehicle. To operate, DRU 20 is connected to VIU 22 using communication and power cable 94, and DRU power key 78 is depressed to provide power to DRU 20 through VIU 22, or from battery 200. Upon power-up of DRU 20, a unique identifying signal is communicated from DRU 20 to VIU 22, and VIU microcontroller 112 is programmed so as to allow vehicle operation only by a person (or persons) possessing a DRU 20 having an acceptable identifying code. When the code of DRU 20 and the preprogrammed acceptable code(s) of VIU 22 match, VIU microcontroller 112 sends a signal through line 150 to start enable relay circuit 144, which functions to interconnect start terminal 36 and start enable terminal 38 of vehicle interface connector 26, thus allowing ignition of the vehicle.

As an alternative, bypass switch 142 can be operated to interconnect start terminal 36 with start enable terminal 38.

Upon ignition of the vehicle, DRU microcontroller 184 sends a signal through line 266 to actuate beeper 264, to provide an audible prompt to the operator. The operator then depresses P/B/C key 82 to select whether the mileage to be driven is personal, business or for commuting, and such information is communicated to DRU microcontroller 184 and a corresponding legend appears on display 92. As the vehicle is operated, the distance pulses from vehicle interface connector terminal 66 are communicated to VIU microcontroller 112 through pulse signal conditioning circuit 152 and line 154. This information is then communicated to DRU microcontroller 184 through VIU transceiver 156 and DRU transceiver 196, and DRU microcontroller 184 then converts such signals into mileage information, which is com-

municated to and stored in RAM 250. Simultaneously, date and time information is communicated to RAM 250 from clock 256.

Each time the operator changes the designation of the mileage traveled by depressing P/B/C key 82, such information is communicated to DRU microcontroller 184 and to RAM 250, along with date and time information from clock 256. This enables the operator to accurately keep track of business, personal and commuting miles, along with the dates and times such mileage was covered.

At the same time mileage information is communicated through DRU microcontroller 184 to RAM 250, other information pertaining to vehicle operating characteristics is communicated from state input terminals 48, 50, 52 and 54 of vehicle interface connector 26 to RAM 250 through DRU microcontroller 184 and VIU microcontroller 112. For instance, such information may pertain to characteristics such as operation of the vehicle head-lights, directional signals, brake lights or seat belt indicator. This information is stored in RAM 250 for a predetermined amount of time, e.g. five or ten minutes. If desired, this vehicle operating characteristic information can be extracted from RAM 250, so as to enable a person to determine these vehicle operating characteristics for the preceding five or ten minute time period, which may be useful in accident investigations or the like.

When the operator is finished operating the vehicle, DRU 20 is disconnected from VIU 22, and the operator can then carry DRU 20 along in a briefcase, purse or the like. Information pertaining to other expenses incurred by the operator can be input into DRU 20 using QWERTY keypad 74 and numeric keypad 76. Such information is displayed on display 92, and simultaneously stored in RAM 250 through DRU microcontroller 184.

Whenever desired, the operator interconnects DRU 20 with either computer 100 or printer 102. By depressing appropriate buttons of keypad 74, the information stored in DRU RAM 250 is either downloaded into computer 100 or communicated to printer 102 for printing a hard copy of an expense report. When communicating information to computer 100, such information can be interfaced with an expense management program or the like so as to enable such information to be incorporated thereinto.

Appropriate software is loaded into program memory 224 through DRU microcontroller 184 to carry out the above steps. The software stored in program memory 224 can be modified or replaced as desired, permitting DRU 20 to be field programmable for accommodating software updates and/or custom programs for specific user requirements.

Referring back to Fig. 1, other devices, shown generally as future interface modules 280, can be interconnected with DRU 20 through a communication link 282 and a connector 284. For example, such devices may include a portable communication device such as a radio transmitter or a cellular telephone. A communication device such as this enables an operator to relay information contained within DRU RAM 250 to a remote receiving device, such as a radio receiver or other cellular communication device, for communicating information from RAM 250 to a remote station. Representative applications for this type of system include transmitting expense information from traveling sales personnel to a central expense tracking facility, or transmitting transportation service information to a central facility. For example, a transportation service for disabled individuals can input a unique identifying code for each user, and information pertaining to the distance the user was transported can automatically be transmitted to a central processing facility for enabling the transportation service to rapidly generate a bill for such transportation services rendered to that individual. Numerous other applications for the system of the invention are contemplated, utilizing either transmitting or receiving equipment.

Various alternatives and embodiments are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter regarded as the invention.

Claims

1. A vehicle monitoring and data recording system for use with a vehicle, comprising:

   a vehicle interface unit adapted for interconnection with the electrical system of the vehicle for sensing one or more vehicle operating characteristics and for outputting a first set of data signals indicative of the sensed vehicle operating characteristics; and

   a portable recorder unit adapted for removable interconnection with the vehicle interface unit, comprising a memory; an input for receiving the first set of data signals from the vehicle interface unit and for providing the first set of data signals to the memory; a manually operable data entry device for allowing an operator to input data and for outputting a second set of data signals in response thereto to the memory; and a processor interconnected with the memory; wherein the data recorder unit is disconnectable from the vehicle interface unit and connectable to an external device for selectively outputting, to the external device, a third set of data signals from the memory which includes at least the first and second sets of data signals.

2. The system of claim 1, wherein the vehicle interface unit comprises a module interconnected via a series of lines with the vehicle electrical system,

each line providing a signal to the vehicle interface unit module indicative of one of the vehicle's operating characteristics.

3. The system of claim 2, wherein the vehicle interface unit includes a processor interconnected with the lines for processing signals received from the lines and generating the first set of data signals in response thereto.

4. The system of claim 3, wherein the vehicle interface unit is interconnected with the ignition system of the vehicle and includes an arrangement for preventing vehicle ignition unless the data recorder unit is connected to the vehicle interface unit.

5. The system of claim 4, wherein the vehicle ignition system includes a start terminal and a start enable terminal, and wherein the ignition preventing arrangement comprises a circuit including the processor for detecting connection of the data recorder unit to the vehicle interface unit.

6. The system of claim 5, wherein the vehicle interface unit includes a programmable device for entering a unique identifying code for each individual authorized to operate the vehicle, and wherein the vehicle interface unit processor functions to prevent vehicle ignition by an unauthorized individual.

7. The system of claim 1, wherein the vehicle interface unit is interconnected with the input to the vehicle's odometer to receive data signals therefrom and to enable monitoring of the vehicle's mileage.

8. The system of claim 7, wherein the manually operable data entry device comprises a keypad including a key allowing an operator to input a signal to the memory of the data recorder unit indicative of business or personal operation of the vehicle.

9. The system of claim 7, wherein the vehicle interface unit is further interconnected with the electrical system of the vehicle to sense one or more of the following vehicle operating characteristics; brake operation, directional signal operation, and headlight operation, and seat belt operation.

10. The system of claim 1, wherein the vehicle interface unit is interconnected with an electrical interface connector associated with the vehicle for receiving signals therefrom indicative of one or more of the vehicle operating characteristics.

11. A method of monitoring vehicle operating conditions and recording data, comprising the steps of:

sensing one or more vehicle operating characteristics;

generating a first set of data signals indicative of the one or more sensed vehicle operating characteristics;

storing the first set of data signals in a portable recorder unit removably interconnected with the vehicle;

generating a second set of data signals by manual operation of a data entry device;

storing the second set of data signals in the portable recorder unit;

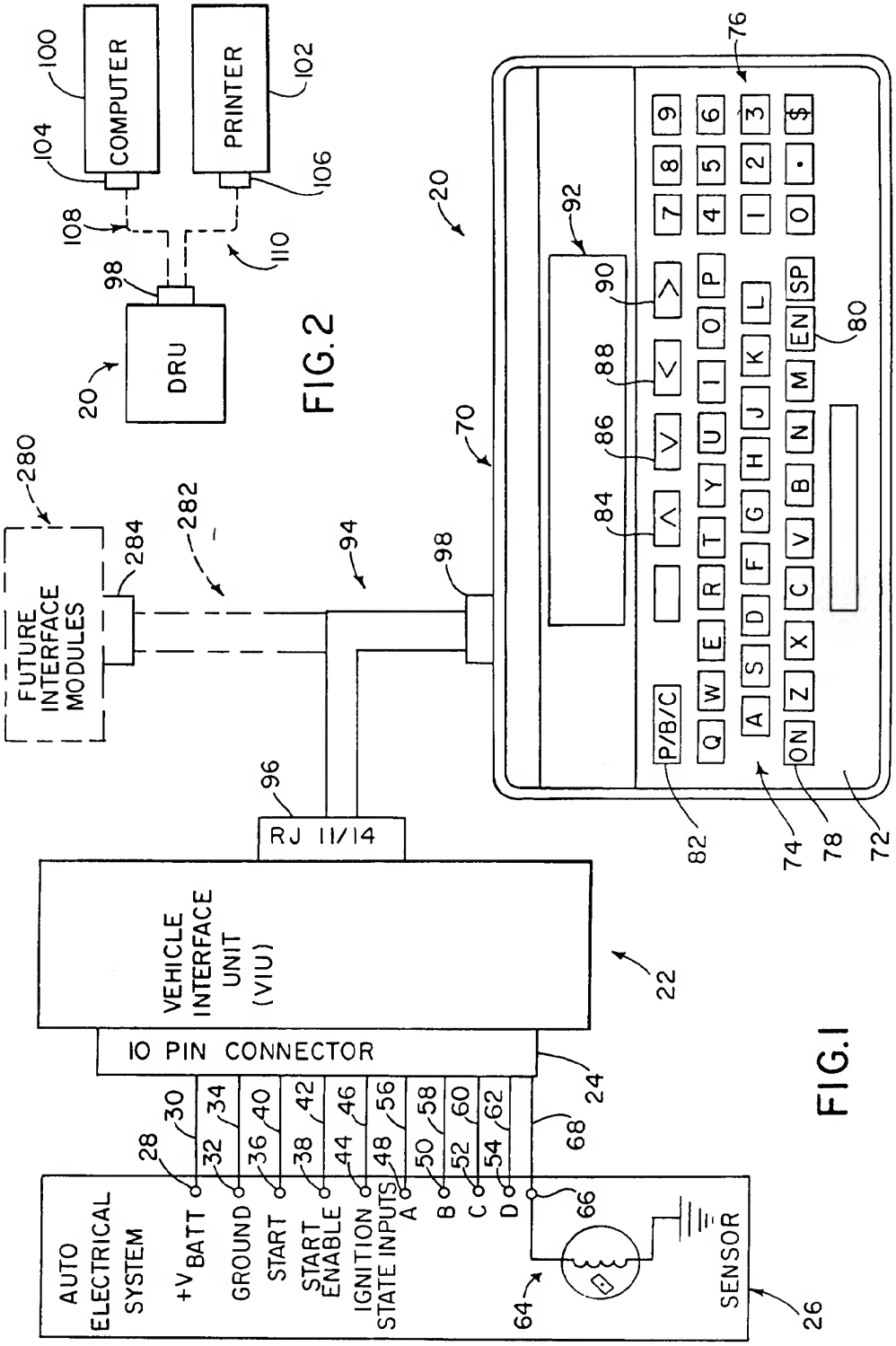
disconnecting the portable recorder unit from the vehicle and interconnecting the portable recorder unit with an external device; and

selectively outputting, to the external device, a third set of data signals from the portable recorder unit which includes at least the first and second sets of data signals.

12. The method of claim 11, wherein the step of sensing one or more vehicle operating characteristics is carried out by permanently mounting a vehicle interface unit to the electrical system of the vehicle for receiving signals therefrom indicative of one or more vehicle operating characteristics, wherein the portable recorder unit is removably interconnectable with the vehicle interface unit.

13. The method of claim 12, wherein the step of generating a second set of data signals by manual operation of a data entry device is carried out by manual operation of a keypad provided on the portable recorder unit.

14. The method of claim 13, wherein the step of generating a second set of data signals comprises generating a set of data signals indicative of personal or business use of the vehicle by manual operation of the keypad.


AUTO ELECTRICAL SYSTEM
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GROUND
START
START ENABLE
IGNITION STATE INPUTS
A
B
C
D
SENSOR
10 PIN CONNECTOR
VEHICLE INTERFACE UNIT (VIU)
RJ 11/14
FUTURE INTERFACE MODULES
DRU
COMPUTER
PRINTER
P/B/C
ON
EN
SP
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102
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108
110
280
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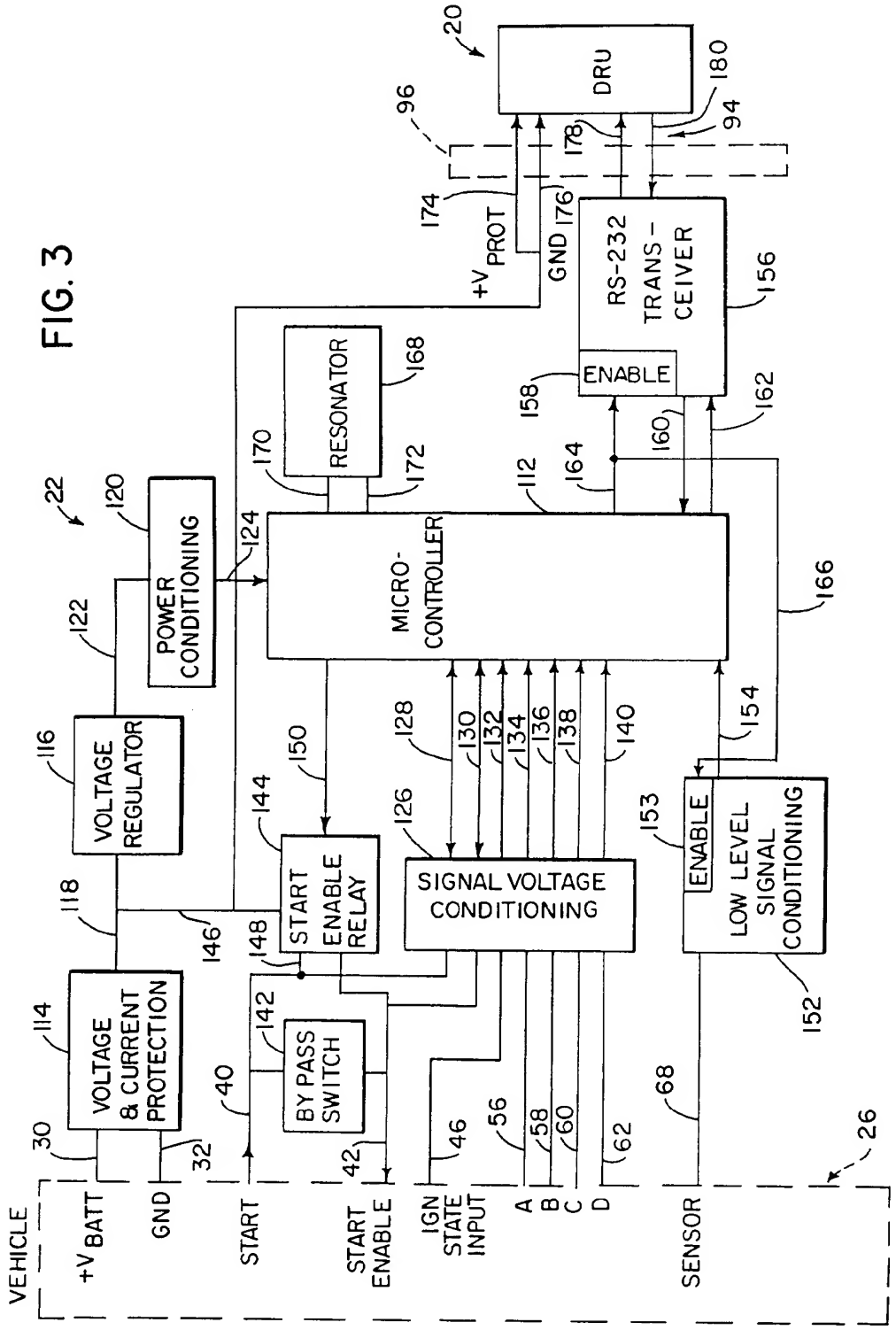
284

FIG.1

FIG.2

FIG. 3


VEHICLE
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START ENABLE
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B
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56
58
60
62
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VOLTAGE & CURRENT PROTECTION
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VOLTAGE REGULATOR
116
118
POWER CONDITIONING
120
122
22
MICRO-CONTROLLER
124
112
RESONATOR
168
170
172
START ENABLE RELAY
144
146
148
150
BY PASS SWITCH
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SIGNAL VOLTAGE CONDITIONING
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LOW LEVEL SIGNAL CONDITIONING
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153
154
ENABLE
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GND
176
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DRU
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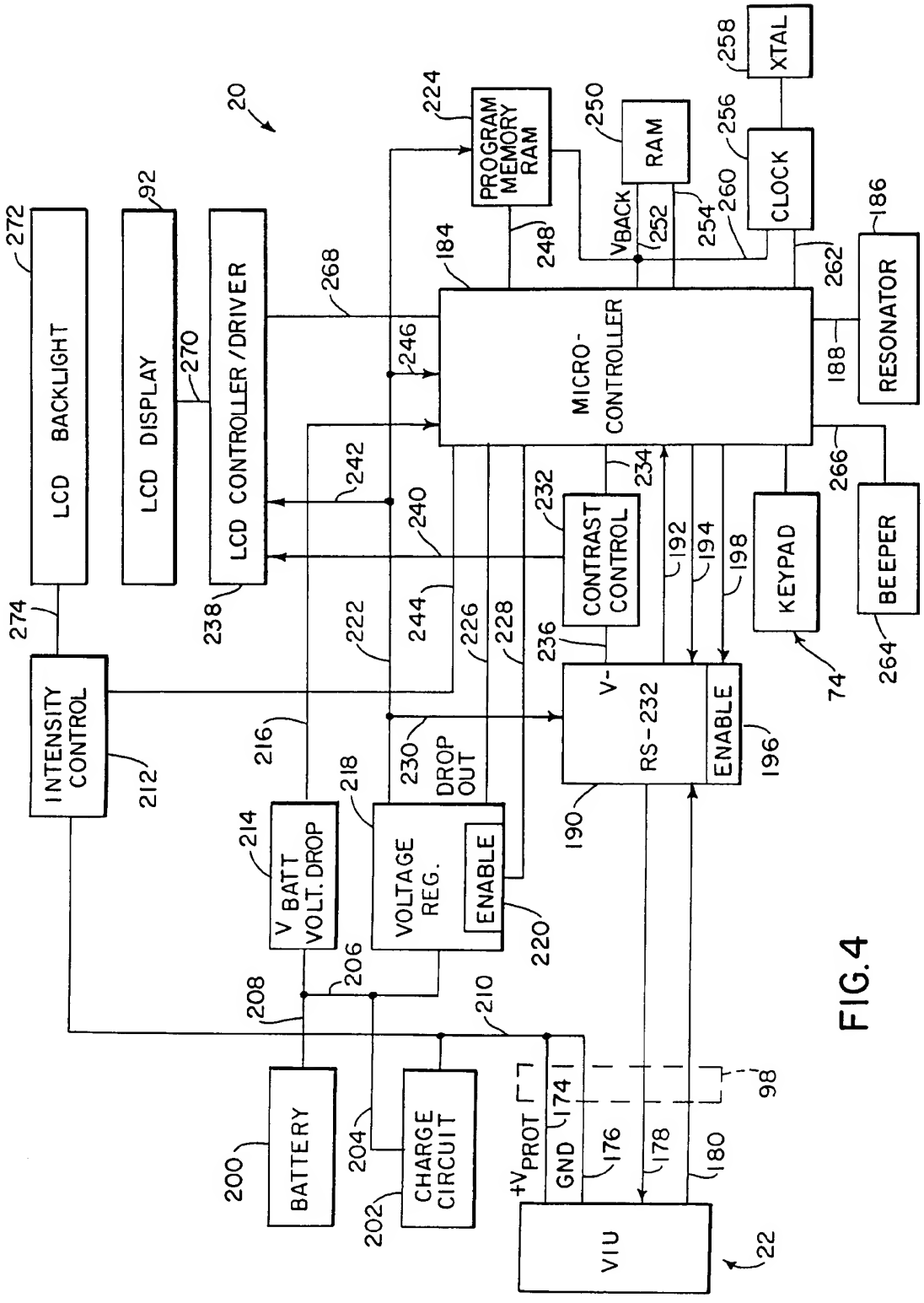
94
96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272
LCD DISPLAY
92
LCD CONTROLLER/DRIVER
270
268
PROGRAM MEMORY RAM
224
RAM
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XTAL
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CLOCK
256
MICRO-CONTROLLER
184
246
248
VBACK
252
254
260
262
RESONATOR
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188
242
240
232
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CONTRAST CONTROL
192
194
198
KEYPAD
74
266
BEEPER
264
238
222
244
226
228
236
INTENSITY CONTROL
274
212
216
V BATT VOLT. DROP
214
218
VOLTAGE REG.
ENABLE
220
230
DROP OUT
V-
RS-232
ENABLE
190
196
208
206
210
BATTERY
200
CHARGE CIRCUIT
204
202
+VPROT
GND
174
176
178
180
98
VIU
22

FIG.4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 3963

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	DE-A-31 47 314 (WESSER) * page 5, line 19 - page 9, line 26 * * page 10, line 15 - page 19, line 8; figures *	1,2,7,8	G07C5/08
Y		9-14	
A		4-6	

Y	EP-A-0 224 616 (GELHORN) * column 3, line 29 - column 7, line 4; claims; figures *	1-14	

Y	DE-A-32 21 399 (KIENZLE) * page 4, line 17 - page 7, line 26 * * page 8, line 30 - page 9, line 30; claim 1; figures *	1-3,7,8	
A		9-12	

Y	GB-A-2 244 582 (BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY) * abstract; claims; figures * * page 2, line 29 - page 3, line 18 *	4-6	
A		1,2,11	TECHNICAL FIELDS SEARCHED (Int.Cl.5)
	---		G07C
A	GB-A-2 119 095 (GOLDCREST ELECTRONICS) * page 2, line 17 - page 3, line 26 * * page 3, line 56 - page 4, line 22 * * page 6, line 5 - line 51; figures *	1-3,5, 7-12	

A	WO-A-92 22043 (WB ELECTRONIC) * page 14, line 20 - page 15, line 29 * * page 19, line 13 - page 20, line 5; figures *	1-3,7-14	

	-/--		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	30 September 1994	Meyl, D

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 3963

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	WO-A-82 02785 (DYRDAK) * page 3, line 10 - line 34 * * page 5, line 5 - page 6, line 8 * * page 9, line 22 - page 11, line 21; figures *	1,7-11	
A	US-A-4 939 652 (STEINER)		
A	EP-A-0 495 104 (K.K. KOMATSU SEISAKUSHO)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)

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L : document cited for other reasons

& : member of the same patent family, corresponding document

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